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## High Voltage Electrical Grounding Training

Contact us Today for a FREE quotation to deliver this course at your company's location.

<https://www.electricityforum.com/onsite-training-rfq>

A properly designed and installed grounding system ensures reliable performance of electrical substations. Fast clearing of faults, made possible by good grounding, improves the overall safety and reliability of an electrical system.

This one-day course will provide the basic principles of grounding a power supply network to ensure safety of personnel and equipment. Understanding these principles will provide the correct tools to design a grounding system applicable to utility networks and industrial plant distribution. This course covers the basic procedures in working safely on medium and high voltage systems.

### WHAT YOU WILL LEARN:

- The basic principles of grounding of medium and high voltage electrical systems
- Protective or Safety grounding system

- Safe and unsafe working conditions
- Design considerations of a grounding grid for medium and high voltage
- Measuring of ground resistance, resistivity in substations
- Protection of substations from lightning energy

### WHO SHOULD ATTEND

- Utility and Industrial Electrical Engineers and Engineering Technicians
- Project Engineers
- Design Engineers
- Field Technicians
- Electrical Technicians
- Electricians
- Plant Operators
- Plant Engineers
- Electrical Supervisors

### STUDENTS RECEIVE

- 100-Page Digital Electrical Grounding Handbook - Value \$20 (details below)
- 0.7 Continuing Education Unit (CEU) Credits
- A **FREE** Magazine Subscription (Value \$25)
- **\$100** Coupon toward any future Electricity Forum event (restrictions apply)
- Course Materials in Paper Format

### COURSE OUTLINE

**High Voltage Electrical Grounding and Bonding For Utility and Industrial Applications**

## **Course Instructor**

*Pablo Diaz, P. Eng, Electrical Grounding Consultant, The Electricity Forum*

## **OVERVIEW**

- Basics Of High-Voltage Grounding
- Electrical Bonding of High Voltage Systems
- Proper Sizing of Conductors
- Grounding of Substations
- High-Voltage Surge Protection
- Electrical Grounding for Lightning Protection

## **SUBSTATION GROUNDING DESIGN**

### **SESSION 1: DEFINITIONS AND INTERPRETATIONS**

- Determination of Need of Personal Protective Grounding
- Basic Criteria for Safe Grounding Practices
- Electric Shock Hazard
- Grounding Practices
- Basic Design Options
- Soil Resistivity
- Ground Fault Currents
- Fault clearing Time

### **SESSION 2: GROUNDING OPTIONS**

- Ground Cable Assemblies

- Grounding Cable Ampacities
- Grounding Cable Reactance
- Parallel Grounds
- Grounding Clamps
- Grounding Insulated Power Cable
- Ground Potential Rise (GPR) in Medium- and High-Voltage Systems

### **SESSION 3: GROUND GRID DESIGN FOR SUBSTATIONS**

- Determination of Maximum Available Fault Current
- Exposure Voltage Calculations for Plants & Switchyards
- Touch and Step Potential
- Transferred Potential
- Elimination of Step and Touch Potential
- Selection of the Right Connector
- Horizontal Grid Design IEEE STD 80-2000
- Introduction to 2-Layer Soil Model
- Vertical Rods Connected by a Grid
- Temporary Grounding

### **SESSION 4: SWITCHYARD AND SUBSTATION PROTECTIVE GROUNDING**

- General Considerations for Placement of Protective Grounds
- Power Circuit Breakers and Transformers
- Disconnect Switches and Bus
- Insulated High Voltage Cable
- Cable Terminations
- Midsections and Splices
- Grounding Transformers and Phase Reactors
- Capacitor Banks

## **SESSION 5: POWER LINE PROTECTIVE GROUNDING**

- Grounding of Metal Transmission Structures
- Slip Joints
- Steel Pole Structures
- Overhead Ground Wires
- Structure Footing Ground
- Grounding on Wood Pole Transmission Structures
- Transmission Line Terminal Ground Switches
- Grounding on Distribution Lines
- Surface Equipment and Vehicle Grounding

## **SESSION 6: TECHNICAL CONSIDERATIONS IN PROTECTIVE GROUNDING IN SUBSTATIONS AND SWITCHYARDS**

- Substation Grounding System
- Typical Shock Situations - Conditions of Danger
- Structure Touch
- Electric Circuit for Switch Operator Sources of Hazardous Current on De-energized Equipment
- Grounding and Jumpering Requirements
- IEE Std 80-2000

## **INTERNATIONAL AND LOCAL REGULATIONS**

- CSA
- IEEE 80-2000, IEEE Guide for Safety in AC Substation Grounding, 2000
- ASTM F 855-97 Standard Specifications for Temporary Protective Grounds
- IEEE 1246-2002, IEEE Guide for Temporary Protective Grounding Systems Used in Substations
- IEEE 1048-2003, IEEE Guide for Protective Grounding of Power Lines, 2003

## **COURSE SCHEDULE**

### **Both days:**

Start: 8:00 a.m.

Coffee break: 10:00 a.m.

Lunch: 12:00 noon

Finish: 4:30 p.m.

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